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West Europe Report

SCIENCE AND TECHNOLOGY

No. 153

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BIOTECHNOLOGY

UNIVERSITY OF MUNICH HAS ELECTRONIC DNA SYNTHESIZER

Hamburg DIE ZEIT in German 27 May 83 p 33

[Article by Horst Ibelgaufts: "Saves Downtime"]

[Text] The device is about as big as a refrigerator and looks equally insignificant. Since May it has occupied a spot in a basement laboratory of the Institute for Biochemistry at the University of Munich. However, the apparatus is not to be classed with the laboratory glassware: It is the first gene machine of its kind in Europe.

Fully automatically, the device officially named "synthesis automat" spits out highly prized biomolecules of the genetic substance deoxyribonucleic acid--internationally abbreviated as DNA--in milligram quantities spliced as specified by the input program.

The mechanical production, initially of only short DNA sequences of course, was possible so early in the history of the molecular-genetic revolution because the scheme for storing genetic information in DNA involves only four letters. The exact sequence of four different DNA components called nucleotides determines the genetic message for all life forms on the earth. And the gene machine is capable of splicing nucleotides into DNA chains per specification faster than any biochemist can do by hand--fast, accurate and overnight (also see ZEIT Dossier Nr. 35/1981, page 10).

For the layman this may seem almost like the materialization of Faustian dreams. However, the notion that life is being created by the automats is "of course, nonsense," according to chemist Thomas Doerper. The keeper of the gene machine knows: "The purest chemicals are put into the machine and after a while a pure synthetic chemical product comes out. From the chemical standpoint, the product is of course DNA; but from the biological perspective, the product is absolutely dead."

In a highly simplified model, the DNA molecule resembles a rope ladder. Doerper: "In a manner of speaking, we produce only half of this rope-ladder model. By the time the company's microbiologists make a biologically active gene or gene component from what we deliver him, a lot of water will have flowed down the Isar. Strictly speaking, the device is nothing but a synthesis Idiot and is just as practical or impractal as any other laboratory

device which takes over a task. Synthesizing DNA is a monotonous assembly-line job. The machine simply saves downtime."

This is true in general but is a strong understatement. Only at the beginning of the 1970's was the Indian-American scientist and Nobel Prize winner Har Gobind Khorana successful--a historical first--in totally synthesizing a complete gene. To start with, he had to develop the process largely from scratch. But what he and his 20-member team were then able to brew up during several years of tedious Sisyphusian labor, the automat can now accomplish in just under a day and a half. The gene machine requires just 18 minutes to add--reproducibly and with good yield--a specified link to the growing biomolecular chain.

Theoretically, the automat working continuously day and night would require about 137 years to reproduce the genetic material of just a single bacterium. A bacterium does twice as much in just 20 minutes. For all the hereditary information of mankind, all of 100,000 years would be required. Such an undertaking could not be accomplished even with a battery of such machines; but there is no reason to do it.

"Chemically synthesized genes, or at least gene fragments," explains Professor Ernst-Ludwig Winnacker, Director of the Munich Institute," are today playing a greater and greater role in gene technology and molecular biology." Only X-ray structural analysis of particular short DNA fragments has for example revealed in addition to the two expected DNA forms a third form not known before--now called Z-DNA--which promises to be of some biological importance." (See ZEIT Nr. 18/1983).

Winnacker's institute will use the machine for synthesizing gene fragments for basic research in building small genes for storing the information of medically important protein molecules. Winnacker: "Consider for example insulin and hypophyseal hormones: Chemical synthesis is in many cases not only very much easier than tediously fishing genes out of the nearly unmanageable mass of hereditary material; it is often the only available method. Synthetic genes offer, when available, the potential for manipulating isolated hereditary material in order to see how gene changes affect the biological activity of the genetic product. In situ this is not possible since we gene technologists can, of course, only work with that which nature freely provides."

Also involved is research on molecular structure and biological effect. "Even now an entirely new development in molecular biology--synthetic biology--is coming on line," continues Winnacker. "One can for example synthesize entirely new insulin genes according to plan. These genes produce insulin variants of which several may be clinically relevant since they still possess insulin effects but exhibit completely different physical and biochemical properties than natural insulin." There is no danger that the machine will disemploy or displace the Munich chemists; rather, they are freed for other research tasks and are in addition fully employed in synthesizing the basic chemicals used by the machine. Many of these are not commercially available or are much too expensive.

The DNA chemists have their jokes about the electronic gene machine. When meeting a gene-machine operator at lunch they sometimes ask: "Well, don't you ever quit synthesizing?"

9160
CSO: 3698/367

HARRIS DISCUSSES EUROPEAN MINICOMPUTER PRODUCTION WITH BULL

Paris AFP SCIENCES in French 11 May 83 pp 26-27

[Text] Harris discussed French production with Bull--On 10 May, in Paris, Mr Jack Hartly, chief executive officer of the company, announced that the American company Harris, one of the world leaders in communications equipment, is discussing the production of minicomputers with the French nationalized data processing group, Bull.

"If we want to succeed in Europe, we must be in France; this is our number one objective in Europe, which represents 90 percent of our sales outside the United States, and we are open to all proposals," Mr Hartley stated as he was passing through Paris. Harris has already concluded an agreement with Matra for semi-conductors in 1979.

Harris seeks particularly to assure the distribution of those minicomputers used in engineering and education, but would be ready to transfer to France a section of its research and even its production capabilities if the government wished it.

The Harris Group has been in data processing in France for five years, and has a revenue of 20 million francs in this area, but it is especially active in the area of integrated circuits thanks to its agreement with Matra. This association, called Matra-Harris Semi-Conductors, foresees a 700 million franc revenue in 1985, to be accomplished at the plant in Nantes (western France).

Harris, which has achieved a worldwide revenue of 1.7 billion dollars in 1982 (12 billion F) wants to develop its data processing sector (30 percent of its total activity) which is growing at a rate of 21 percent per year. The Harris Group is the second largest supplier of satellite equipment for the American Government and one of the world leaders in semi-conductors.

9865
CSO: 3698/324

DISCUSSIONS UNDER WAY TO EXPAND MATRA, HARRIS AGREEMENTS

Paris ELECTRONIQUE ACTUALITES in French 20 May 83 p 13

[Article by F. Grosvalet]

[Text] During a visit to Paris, Mr John T. Hartley, president of the Harris group, announced that his company, which claims to be very satisfied by its MHS (49 percent Harris) agreement with Matra in semiconductors, is currently holding talks with the nationalized French computer group Bull (see elsewhere in this issue), to develop its minicomputer activity in France. He also added that although Harris is ready to do anything to hasten the discussions, an agreement does not appear to be near.

In semiconductors, an area in which Harris' presence in our country is the strongest through the intermediary of MHS, which provides exclusivity for the group's components in France (the French office of Harris Semiconductor is primarily a coordinator), the company declares itself ready to increase its collaboration with the French company, both in financing and in transfer of technologies (oxide isolated bipolars, for instance), or in a joint development of specific products for the European markets in general, and the French market in particular. According to Mr Hartley, MHS, which was created in 1979, should achieve revenues of 700 million francs in 1985.

In 1982, Harris had world-wide revenues $1.3 billion in electronics (for $250 million, which will be reinvested in this area, it has just dropped its printing activities, which represented a revenue of $417.3 million in 1982). Of this total, semiconductors represented a little over 11 percent (30 percent if sales in the government sector are spread over the three other areas of computers, communications, and semiconductors) at $147.2 million, a drop of 18.4 percent with respect to 1981, drop which is chargeable mainly to CMOS and bipolar digital IC's. Moreover, the semiconductor activity experienced a deficit of $4.5 million in 1982 (a profit of $25.9 million in 1981). Nevertheless, it is in this sector that Harris' sales should see the greatest growth during the next five years (+33 percent per year against 21 percent for the group as a whole). We might point out that Harris sells more than 90 percent of its semiconductor production outside the group, with the government sector representing more than 50 percent of this commercial activity.

CMOS 8086 Sampled in June

Harris, which claims to be the American leader in CMOS technology--the only world competitors being Japanese (it considers itself the second largest in the world in this field)--should sample the CMOS version of the 8086 16-bit microprocessor in June. The 80C86 was developed by the group as part of the technical exchange agreement with Intel, which required it to supply Intel with its CMOS technology in exchange for information necessary to manufacture the 8086. Discussion are currently under way with MHS for the eventual production of the 80C86 in Nantes, but according to Mr Hartley, no decision has been reached.

As for future CMOS products that would fit within the Intel-Harris agreement, discussions will be held at the proper time among the three companies (the first two and MHS) to determine who will do what.

Harris also adds that it does not participate in the agreements between the French company and Intel insofar as HMOS products are concerned, these agreements being materialized in Cimatel.

Questioned about the NEC-MHS agreement for 4-bit CMOS microcontrollers, Mr Harris indicated that in his view this collaboration was good for the French company, and that since the agreement is strictly limited to the production of specific circuits for the French market, it does not risk to harm Harris on the world market.

To fight Japanese competition in CMOS, the group has focused its research and development efforts on high performance memories and microprocessors. It has under development a CMOS 16K PROM with an access time of 175 ns, and a 16-bit microprocessor with a 32-bit internal architecture on two chips (joint development with DEC).

In bipolars, another advanced sector for Harris, the group is developing in collaboration with MHS, an improved oxide isolation technology which should be transferred to France as soon as the development is completed. Within one to two years, MHS should thus be producing bipolar analog components in Nantes, as initially planned but with a small delay.

In this area, the group's strong points for the future are PROM's and programmable logic networks which in principle will also be manufactured by Harris in the future.

We might add that Harris is carrying out a large research and development activity in galium arsenide, and that it has recently reached an agreement in this field with Cray Research (see ELECTRONIQUE ACTUALITES of 25 March 1983).

11,023
CSO: 3698/377

THOMSON-EFCIS: COMPANY ACTIVITIES, NEW PRODUCT REPORT

Paris ELECTRONIQUE ACTUALITES in French 3 Jun 83 p 11

[Article by F. Grosvalet]

[Text] 702 Million Francs for Thomson-Efcis in 1983

Thomson-Efcis, which in 1982 had revenues of 570 million francs (36.6 percent in exportation)--for a growth of 24 percent over 1981--should reach 702 million francs in 1983 without Eurotechnique, for a growth of 23 percent. We might point out that in 1982, Eurotechnique had revenues of 50.9 million francs, and that before being bought by Thomson, the 1983 forecasts were 125 million francs.

In 1982, bipolar IC's represented 59 percent of the company's revenue, with MOS and systems accounting for 41 percent, including research.

In the bipolar area, professional linear IC's represented 40 percent of sales last year, followed by consumer IC's (29 percent), industrial IC's (21 percent), digital IC's (5 percent), and special devices.

For MOS and systems, the distribution was: custom circuits (31 percent), telecommunications (23 percent), systems (19 percent), microprocessors and memories (18 percent), and other innovative circuits such as graphic or alphanumeric processors (9 percent).

Thomson-Efcis has begun sampling the third member of its graphic coprocessors, the 625/525-lines multi-standard EF 9367, upward logic compatible with the EF 9365 and 9366 introduced two years ago. The company currently accepts volume orders for October delivery; the next circuit, the 9368, has already been announced.

The 9367 is thus different from its predecessors through its compatibility with European (625 1/50 Hz) and American (525 1/60 Hz) standards, as well as through a doubled horizontal resolution up to 1024 points per line (typically 256, 512, and 1024, plus the possibility of 320, 384, 640, and 768 with external PROM), the possibility of full screen display (the previous ones allowed only a square display), and a new type of state register.

The 9367 is currently sampled at 400 francs per unit, against 300 francs for the 9365 and 9366 which are now in volume production, but which are not yet widespread (30,000 units have been sold so far, and the total should reach 50,000 by the end of the year). Eventually, the volume price of the 9367 should reach 50 francs, with a predicted market of 10 million units in 1985-1986, primarily through exportation to the American continent. In decreasing order of size, today's markets for the Thomson-Efcis graphic coprocessors are France, FRG, and Great-Britain.

The French company also sells for 650 francs a protokit containing a 9367, its specification sheets, and seven application notes. Depending on manufacturer, the latter go from the bottom of the line (color graphic terminals, personal and household computers, sophisticated video games) to the top, and since there is no limit on colors, it becomes possible to obtain 256 colors with 16 million shades (CAD, three-dimensional animation, color displays for fashion, and so on).

The 9367 does not at present have a second source, but negotiations are in progress and an agreement should be signed next year (AMD is already second source for the 9365). The only competition on the market is NEC's 7220, manufactured as second source by Intel and SMC, but according to Thomson-Efcis, intended for applications that are much more sophisticated and thus more difficult to implement.

The major characteristics of the 9367 are: vertical resolution of 208 (interlaced) or 416 (non-interlaced) at 525 l, and 256 or 512 at 625 l; high speed vector generator (1,500,000 pts/s max, and 900,000 pts/s typical); four types of lines; integrated 16K and 64K DRAM addressing and refreshing; integrated ASCII character generator (96) with a maximum density of 170x57 characters and programmable character dimension and orientation.

The 9367 is built with a 3 micron NMOS technology (4 micron for its predecessors) and is offered in a 40-lead DIP package.

Moreover, Thomson-Efcis, which has already sold one million EF 9340/41 alphanumeric display kits (VEN and GIN circuits for videotex), is not abandoning the alphanumeric field, and during 1984 should introduce (volume production by the end of 1984) the VGP (Visu Grand Public--Consumer Visu, an internal Thomson name which is therefore not final) which integrates the 9940 and 41 on a single chip with some improvements such as the possibility of 80-character lines (25 lines of 40 or 80, against 24 lines of 40) and the possibility of using dynamic RAM's thanks to integrated refreshing.

11,023
CSO: 3698/377

AEG-TELEFUNKEN AUTOMATED MICROCIRCUIT PRODUCTION PROCESS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
19 May 83 p 7

[Article: Mask Layout for Microwave Circuits]

[Text] AEG Telefunken AG, Frankfurt/Berlin. Compared with the conventional method of making masks for micro- and millimeterwave circuits by etching, which involves for instance cutting the contours in rubilith foil, a method developed by AEG Telefunken which employs a computer and a numerically controlled plotter offers numerous advantages. On the one hand, the number of error sources in the process is reduced and mask layout, design and production are significantly speeded up; on the other hand, new design possibilities are opened up such as the generation of extremely complex circuit routings and the replication of similar layouts, so reports the company.

For this the electrotechnical firm developed the FORTRAN program Cosmic which the development engineer can use as a tool to straightforwardly generate his own layout. Required for implementation are a FORTRAN-programmable computer, a Calma processor and a numerically controlled light-beam plotter. The user only has to program the outer contours of the areas to be blackened in the layout and to support this effort a comprehensive program library is available. The library contains programs which solve frequently occurring geometric problems; routines which replicate standard circuit blocks and routines which translate layout information into a form suitable for the Calma processor. The processor automatically adds to the input contour information the commands for blacking the series of closed polygons. The computed results are then drawn on light-sensitive paper by the numerically controlled photoplotter. Deviations caused by digitizing steps and plotter inaccuracies are shrunk within bounds by the final photoreduction step, according to company information.

9160
CSO: 3698/367

SWEDISH FIRM EXHIBITS CERAMIC CUTTING TOOL AT PARIS SHOW

Stockholm SVENSKA DAGBLADET in Swedish 22 Jun 83 p 14

[Article by Dag Bjerke: "Ceramic Cutting Tools Improve Hard Metal Processing"]

[Text] In the 1950s, German researchers in materials were juggling combinations of the chemical symbols Si, Al, O and N. In the early 1970s, an Englishman compressed and fired a powder of silicon, aluminum, oxygen and nitrogen into something that promised to be useful.

A new, at that time very promising material was born.

Now, 30 years after the first West German patent, Swedish Sandvik is exhibiting one of the first practically possible fields of application for the new ceramic, sialon, at an exhibition of material technology in Paris.

"When we and American Kennametal bought the license for the sialon patent in 1980, we had very great expectations, anticipating a highly interesting material with revolutionary qualities," says Sandvik's Evald Ihs in Sandviken.

"After a couple of years of development and analysis in our labs, the possible areas of application have been narrowed down considerably. For Sandvik's part, the applications are now limited to a cutting tool for processing heat-resistant nickelbased alloys for airplane engines," says Ihs.

"But the material for usual hard-metal cutting devices is so heavily machined that a cutting edge wears out after working a few seconds. With sialon, the cutting time between blade changes could reach one minute," says Bertil Aronsson, research director for Sandvik in Stockholm.

These figures can be compared with working times of around 30 minutes when hard metal is cutting cast iron.

Speed Makes the Difference

But actually it is most often not primarily the time between blade changes that is the bottle neck in the workshop, but rather the speed with which a lathe, milling machine or drill bites into a material.

In this case, the limit is set by the heat produced in high-speed finishing work. Hard metals become soft at 800° C, whereas ceramics can be used a good bit over 1,000° C, with no such problems.

However, it has been shown that in processing steel at high temperatures certain components of sialon react with the iron.

This significantly reduces the market contemplated for the new material, according to Bertil Aronsson.

He estimates that this leaves about one-half to one percent of the total market for milling blades.

For several years, about ten people have been working full-time at Sandvik testing new ceramic cutting tools, devoting a large portion of their time to sialon.

The license purchased in 1980 for some 100,000 kronor included only the basic composition and principal manufacturing procedure of the ceramic, along with the right to the two applications in milling work and moving parts in, for example, combustion engines. patented by Kenneth Jack of the University at Newcastle along with Lucas, a producer of engine parts.

The ten people at Sandvik have tried out various grinding techniques for the component powders, suitable methods of blending, pressing and firing them to produce the final form.

The object of their work has been to adapt the cutting tool in the new material to the company's existing machine equipment and tool clamps.

They have also worked at giving the cutting edges such a shape that the chips rapidly turn back away from the cutting edges to either a part of the cutting tool or to the piece being worked so that they quickly break off, thus removing much of the heat produced.

Efforts have also been directed to finding a process that will yield the most compact, pore-free unit that is reasonably possible. The extraordinary hardness of ceramics and their lack of resiliance make them very brittle when there is any sign of a break present, even the slightest cavity.

The results of these efforts have been studied by means of radio defraction, where the surface of a sample ceramic is X-rayed to reveal its atomic structure by the way the radiation disperses on contact with the sample.

With the same idea in mind, samples have also been studied with an electron microscope, where electrons--like light in an ordinary microscope--either pass through the sample or bounce off its surface, indicating porosity and other critical factors.

These and other techniques furnish a "fingerprint" which registers which desirable and undesirable particles of matter are present in the sample.

With a measure of malicious glee, Tommy Ekstrom displayed such a fingerprint from the competition Kennametal who placed its first sialon cutting tool on the market in 1981

This sample revealed a myriad of probably very undesirable impurities that had crept in, whereas Sandvik's own sample is as pure as a baby's skin.

(It is possible that the analysers at Kennametal in the United States have been able to get a failed smaple from the Sandvik collection and are holding it up to ridicule in the presence of journalists.)

The new sialon cutting devices have also been subjected to devilishly devised tests in lathes, where twice during each revolution they received a sharp blow to see what they could endure. After this ordeal, which cost much money and labor, the range of application for the new fantastic ceramic was reduced to a tiny, tiny niche.

Will the firm recover its money by the sales it makes? Bertil Aronsson did not offer a straightforward answer, pointing out rather that they were introducing along with the sialon, two other, more conventional ceramic cutting toosl at the Paris exhibit.

No Great Optimism

In contrast to his colleague Evald Ihs, Aronsson denied that he should have felt any great optimism for the new ceramic: "Such enthusiasm is foreign to large bureaucratic enterprises."

Evald Ihs believes that Sandvik is one of the companies that have done the most in ceramics by virtue of not rushing into the field.

But now we have been forced by international competition to begin introducing ceramic cutting tools at a time when the total profitability of the company leaves much to be desired.

Bertil Aronsson was eager to point out that Sandvik entered the game late even in hard metal, and that is was doing well.

9992
CSO: 3698/363

SWEDISH GOVERNMENT ADVOCATES PRIORITY FOR CERAMICS R & D

Stockholm SVENSKA DAGBLADET in Swedish 22 Jun 83 p 14

[Text] In materials technology, ceramics is the research field that should grow fastest in Sweden, claims the STU [Council for Technological Development proposal for assigning priorities in the field, to be presented this fall.

The study shows that the nation's ceramics research, both in training and research and development, is very inadequate when compared with that of the remaining industrial world.

STU advocates that ceramic research and development receive as much as 5 to 6 million kronor over a future 3-year period.

Stress will be placed primarily on silicon nitrates and silicon carbides for applications in combustion engines, for example, in gas turbines. Moreover and more specifically, STU thinks that Sweden should work to qualify itself to produce ceramic and metal combinations. Suitable technology for this furnishes the possibilities for combining ceramic's hardness--for the surface of a cutting tool, for example--with metal's tensile strength in an inner supporting structure.

The forthcoming STU study states that the focus of ceramics education, research and development should be located in the Silicate Research Institute in Gothenburg, the Physics Institute at Chalmers in Gothenburg, at the Lulea Technical University, with Asea in Robertsfors and at the Research Center in Studsvik.

Ceramics is actually the offshoot of mankind's very first building materials, clay and pottery.

Hard and Brittle

Ceramics are distinguished primarily by their great chemical resistance, great tolerance to heat, and a hardness whose brittleness proves to be a disadvantage.

Ceramic materials are constructed of naturally abundant elements: nitrogen, oxygen, silicon, etc. They can be produced and shaped with less expenditure of energy than can plastic and steel.

Savings in energy and resources--these two factors make a good case for the future of ceramics.

One of the problems is its great brittleness, explained by the fact that the slightest cavity or fissure cannot be compensated by tensile distortion where stresses are concentrated under pressure.

Difficult to Shape

A concentration of stress can thus easily produce a complete break.

A second problem is the fact that the material's extraordinary hardness renders it difficult to shape afterwards. This fact makes necessary an advanced production technology in an early stage of the manufacturing process, especially since the ceramic's volume shrinks by 20 percent during the heat treatment that follows the compression of the powder mixture.

9992
CSO: 3698/363

NUM INTRODUCES ITS LATEST CNC MACHINE TOOL

Paris L'USINE NOUVELLE in French 24 Feb 83 p 54

[Article by Michel Defaux and Patrick Piernaz: "Num Introduces CNC of the Future"]

> [Text] With this latest addition to its product line, this French firm [Num SA] expects to penetrate the export market. The CNC 760 has two winning cards: Its state-of-the art technology and a competitive price.

"The only way for us to compete with the Japanese was to innovate," was the way it was put to L'USINE NOUVELLE by Yves Saulnier, president of Num SA, which has introduced this week a new generation of numerically controlled machine tools, the 760. Culminating 3 years of design studies and an investment of 20 million francs, this CNC [centralized numerical control (system)] raises the French firm to the technological level of the world giants in this field: Fanuc, General Electric and Siemens.

This is a remarkable accomplishment when one considers the background of this PMI [Small- and Medium-Size Industries] firm employing 200 persons and now a wholly-owned subsidiary of La Telemecanique, which has taken over, in succession, the numerical control activities of CIT-ALCATEL, of Feutrier and, recently, those of Elecma, a division of SNECMA [National Aircraft Engine Study and Manufacturing Company].

These have been turning points in its affairs that have never kept it from investing heavily in research and development and from growing, in a difficult situational environment, at the rate of 30 percent per annum. Its total revenues exceeded 17 million francs in 1977 and 97 million francs in 1982 (the latter figure is a consolidated one including the Swiss firm Guttinger, which it acquired at the beginning of 1982, and , the Num-Guttinger GmbH subsidiary in FRG [Federal Republic of Germany] and the Num SARL subsidiary in Italy).

These European beachheads are indispensable for Num, which, with 60 percent of the French market already dominated by it, can no longer hope to grow unless it exports more. This is all the more true since the French market

(around 800 NC's [numerical-control (systems)] a year) is much smaller that the one across the Rhine (4,000 NC's a year). This, however, means having to beat the Germans in their own backyard, above all, Siemens, which claims sales of 4,500 CN's a year, only 20 percent of which are of Japanese (Fanuc) origin. Num, for its part, has two strong cards: Model 560 for milling machines, and Model 760 for lathes and machining centers.

"These two models are positioned within the Japanese price range," explains Jean Chauveau, the firm's general manager. The number of components in the 760 have been reduced by a factor of 10, through the use of the most advanced LSI [large-scale-integrated] components from the standpoint of integration and data-processing speed, and through the use of ULA [uncommitted logic array] networks. The result has been prices that are competitive: Thus, for a general-purpose lathe, the price of the 760 system would not exceed 40,000 francs.

A Valuable Tool for the PMI

This new CNC, equipped with an integrated automaton, is built around a Motorola 68000 16/32-bit microprocessor working at 32 bits, and controls the axes of the NC (up to a maximum of eight). This technical choice necessitated the installation of Exormacs programming in the Nanterre establishments. This microprocessor is associated with two 8-bit microprocessors for peripheral functions.

The memories also comprise state-of-the-art technologies: REPROM [reprogrammable read-only memory] for the basic memories; battery-powered CMOS [complementary metal oxide semiconductor] memories for the machining programs, and, notably, for the first time in NC's, EEPROM's [electrically erasable programmable read-only memories] for the machine parameters and the automaton programs. The new bay, now available for lathes (millers, by the end of 1983), will be a valuable tool for the PMI. It greatly simplifies the fashioning of parts, using PGP [fashioning by geometric programming], in which the user need merely write the programs of parts directly from their drawings. Another application: Flexible workshops or cells, since the bay also provides DNC [direct numerical control] connections.

One last characteristic: The capability of working at 30 meters/minute, which opens to it the laser cutting machine market. "We are now able to offer a tool that responds to the evolving needs of the machine tools of the future, that is, ever faster-operating and self-correcting machine tools," says Yves Saulnier, with obvious confidence.

9399
CSO: 3698/328

SNIAS SETS UP DIRECT NUMERICAL CONTROL MACHINING SYSTEM

Paris L'USINE NOUVELLE in French 24 Feb 83 p 87

[Article by Patrick Piernaz: "SNIAS Nantes: 48 Machines Soon To Be Computer Controlled"]

[Text] By connecting the numerically controlled milling machines of the structural parts machining center to a central computer, SNIAS [National Industrial Aerospace Company] at Nantes aims to increase the efficiency rate of the machines there from 30 percent to 60 percent.

Between now and April 1983, 21 machines will be connected up to this DNC [direct numerical control] system, which will eventually control all of the 48 machines of the milling cell.

The first result of this system will be the elimination of the workshop perforated tapes, since the programs will all be distributed directly from the computer to the NC's [numerical controls]. This is a significant gain for the milling cell, which handles 500 different parts. Large-sized and complexly fashioned, these parts require very lengthy programs (the equivalent of 400 meters of perforated tape). Those structural components of a plane that are machined on millers frequently require many hours of work. This explains why the DNC solution was preferred over the automatic flexible workshop, in that speed of circulation of the parts is not a high-priority objective.

"It should not be concluded, however, that the principal gains in productivity will be the result of the DNC connection," says Daniel Ferlat, chief of the Industry Section of the SODETEG-TAI [expansion unknown] engineering firm, which designed the installation. For the system, which is presently undergoing tests in the firm's laboratories at Buc, will also perform production management tasks (scheduling and starting up of operations, issuing of work preparation orders and of stores accounting vouchers...), service management functions (keeping track of warehousing and maintenance operations), programming functions (management of parts programs), and production management functions (budgetary accounting, machine outage records, detailed analyses of outages, daily work logs ...).

All of this explains the reasons for the installation of a display-and-keyboard console at the base of every machine to handle transactional dialogue. In addition, each machine-tool station includes a microcomputer connected to the central computer system, enabling it to operate independently for a limited period of time in certain cases of overall operations on a degraded scale.

Several Other Flexible Workshops Being Studied

The connection between computer and machines constitutes one of the difficulties of the entire operation. It is a problem the troublesomeness of which the SODETEG-TAI engineers do not wish to exaggerate, but which is nevertheless a very real one where the machines are of diversified makes--essentially Forest and Polytrace machines, with various types of numerical controls (Num, Bendix, Siemens) that were not designed to be connected to a computer. This is an acute problem that must be dealt with by all the enterprises that are seeking to install a DNC system or a flexible cell using existing machines.

It was especially necessary [in SNIAS's case] to design interfaces for converting from series to parallel connections and distribute the parts program data in BTR [binary tape reader] format.

The cost of the operation (7 million francs) is comprised mostly of equipment. This is SODETEG-TAI's third automated workshop actualization (after the Renault-Boutheon plant and SNIAS's surface-treatment flexible workshop at Saint-Nazaire). Several other flexible workshops are being studied: PPM [Potain Poclain Equipment] at Montceau-les-Mines (welding), SNIAS-La Courneuve (manufacture of composites), and, not to be forgotten, GIAT [Army Industries Group] at Tulle (military components), for which SODETEG was awarded the contract for the advance study and complete simulation of the computer-controlled operation.

[Boxed insert]:

A Centralized Data Processing Structure

The DNC at Nantes is a centralized data processing structure which, for reasons of security, is fully redundant. It provides communication, in a transactional mode, between the decision centers and the work stations comprising the milling cell: Central management, work distribution station, programming, maintenance, monitoring and machine-tool stations.

Its architecture consists of two interconnected VAX 11-750's (1-million-byte ECCMOS [electrically controlled CMOS [complementary metal-oxide semiconductor]] RAM [random access memory], and two VAX 124-million-byte disks), to which the operating position equipment (four printers, nine consoles) and the 48 machine-tool stations are automatically switched, under normal and emergency standby procedures. Each one of them consists of an RT 103 industrial console into which is incorporated an LSI 11-23 processor equipped with a 256-Kbyte RAM and communications interfaces.

9399
CSO: 3698/328

ASEA INTRODUCES NEW GENERATION IN HOT ISOSTATIC PRESS LINE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 21 Jun 83 p 5

[Article: "Hot Isostatic Presses With Twice the Productivity"]

[Text] Allmanna Svenska Elektriska AB (ASEA), Vasteras. The Swedish electrical and electronic firm ASEA has developed a new generation of its Quintus hot isostatic press with which highly stressed, formed parts can be produced quickly and inexpensively, according to company claims. The presses work with operating pressures up to 300 Mfa (3,000 bar) and operating temperatures up to 2,000 degrees C. Several tons of parts can be manufactured during each press cycle. Among the metals processed are alloyed steels, super alloys (based on nickel), titanium and light metal alloys, sintered hard metals and temperature resistant ceramics like silicon nitride and silicon carbide.

The use of high operating pressures and temperatures gives the hot-isostatic-pressed parts a dense, homogenous microstructure which is free from internal defects like pores, cavities, cracks, striations and segregations. Such parts would thus have an extremely high durability and reliability even in hard-use applications, in ASEA's opinion. The big advantage of hot isostatic pressing in the production of parts from high-quality materials would lie in the low production costs resulting from low material scrap and greatly reduced post-forming machining steps. Internal heat exchangers provide for rapid cooling of the manufactured parts so that they can be removed from the pressure chamber within 1 hour. With this fast cooling, there is time for 3 press cycles per day.

The new Quintus hot isostatic presses have work zones with diameters between 250 and 1,250 mm and heights between 460 and 3,200 mm. Even larger work zones are possible. Since a large number of parts can be pressed at the same time, productivity is about doubled and the cost of individual parts benefits correspondingly. Hot isostatic presses are used primarily for forming finished or semifinished parts from metal, ceramic or metal-ceramic (cermet) powders; for making billets from high-grade tool steel or other high-strength materials via powder metallurgical methods; for compacting parts made by conventional powder compression methods, including hard-metal and ceramic tools; for post-compressing cast parts having inner poling and cavities for increasing fatigue strength and, finally, for diffusion welding of similar or dissimilar materials like ceramics and metal and forming parts from fiber-reinforced material and layered composite materials coated with abrasion, corrosion or heat-resistant materials.

9160
CSO: 3698/368

SWEDISH COMPANY DEVELOPS EXTREMELY MOVABLE ROBOT ARM

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 21 Jun 83 p 5

[Article: "Robot Arm Like a Backbone"]

[Text] Frankfurt, 20 Jun. With the enormously increasing proliferation of industrial robots, handling devices and manipulators, one can expect that new and surprising design features will make the news. An example of this and things to come is an extremely agile robot which has been developed by the Swedish firm Spine Robotics in Gothenburg. The arm of this robot does not employ the usual one to three hinges but is composed of a large number of spherical hinges compressively loaded together by four prestressed wires. As the name spine suggests, the arm looks like a human vertebral column and is similarly articulated. The prestressed wires are connected by hydraulic cylinders which in turn are controlled by servo-valves. The selective operation of the servovalves under program control makes it possible to deploy the highly mobile robot arm in the desired manner.

The unit has seven basic degrees of freedom, the usual six possessed by other advanced robots plus one more which effects a twisting motion of the midsection of the arm while the gripper hand rigidifies without moving. Flexibility and long reach permit this robot to reach places which were inaccessible to earlier industrial robots. Thus, for example, an application was developed in a joint effort with Volvo wherein a painting robot paints an automobile chassis from the inside, according to an article in PRODUCTION ENGINEERING magazine (No 5/1983). The French robotics firm Acma has developed a similar agile design for a robot hand by copying the mechanism of an elephant's trunk.

9160
CSO: 3698/368

BRIEFS

NEW ALUMINUM-LITHIUM ALLOY--Aluminum-lithium, a new aluminum alloy earmarked for the aerospace industry, will shortly be marketed by three aluminum producers (ALCOA, BRITISH ALCAN and CEGEDUR-PECHINEY) who divulged their plans along these lines at the Le Bourget aerospace show. This alloy, composed of 2 to 3 percent lithium, the lightest metal in the earth's crust, has a density 7 to 10 percent below that of the traditional aluminum alloys for equivalent or higher mechanical properties. Its use, says its manufacturers, should make aircraft structures around 15 percent lighter. This, unfortunately, makes it 2 or 3 times more expensive than the traditional alloys, inasmuch as lithium is very reactive with oxygen and calls for very special metallurgical precautions, which involves specific production units. ALCOA has invested $50 million in the construction of a new foundry, and BRITISH ALCAN will announce the opening this summer in England of a pilot facility capable of producing 1-ton ingots. For its part, PECHINEY, which already owns a prototype installation manufacturing 50-kg ingots is considering construction of a foundry capable of producing 6-ton ingots. Aluminum manufacturers acknowledge that for them this alloy represents a breakthrough in composite materials (primarily carbon fiber) in the aerospace field. Currently under development, aluminum-lithium will not be available industrially until 1985. [Text] [Paris AFP SCIENCES in French 2 Jun 83 p 71] 9436

CSO: 3698/360

BILL OUTLINES FRENCH NATIONAL STRATEGY

Paris AFP SCIENCES in French 19 May 83 p 2

[Text] On 18 May 1983, the secretary of state to the prime minister submitted the first draft bill to the Council of Ministers, according to a communique issued by the Council. This 5-year plan defines France's strategic choices, as well as her goals and major development initiatives for the 1984-1988 period.

The general guidelines of the bill were discussed by the Council of Ministers on 20 April 1983. The guidelines were then adjusted to take into account the Economic and Social Council's recommendations on the role of small and medium-sized businesses, of agriculture, of craftsmen, and policy as regards the family. The Economic and Social Council's recommendations also covered the priority to be accorded apprenticeship training, professional training and research.

The Council of Ministers' communique indicated that implementation of the plan will involve two high priority programs, whose contents will be decided upon in the second draft bill. These programs will have the following objectives:

1. Modernization of industry with the help of new technologies and efforts to economize;

2. Ongoing renovation of the educational system and training for youths;

3. Encouragement of research and innovation;

4. Development of the communications industries;

5. Reduction of France's dependence on [foreign] energy;

6. Action to reduce unemployment;

7. More effective sales in France and abroad;

8. An environment that promotes the family and the birth rate;

9. Effective decentralization;

10. Improvement in living [conditions] in the cities;

11. Modernization and better management of the health system;

12. Improvement in justice and security.

The bill will be submitted to the Parliament, so that it may be approved during the current legislative session.

12420
CSO: 3698/354

FRENCH GOVERNMENT SETS UP RESEARCH TAX CREDITS

Paris AFP SCIENCES in French 23 Jun 83 p 3

[Text] The French Government has just completed the technical preparations necessary to provide a detailed explanation of how the 25 percent tax credit will work. These tax credits will benefit those industrial and commercial firms which increase their levels of spending on research.

According to the minister of industry and research, the concept of tax credits for research was approved in the 1983 tax bill. It was necessary to translate this simple concept for fiscal matters between the state and private industry, i.e. into concrete measures, eliminate factors which penalize initiative, instead of increasing government subsidies.

The following are ways in which the research tax credits are highly beneficial:

--They encourage private industry as a whole, and especially the small- and medium-sized industries, to engage in research, so as to remain competitive in the future;

--They foster research efforts in all forms: capital investment, as well as personnel expenditures;

--The automatic nature of the assistance and its universality make the credits "unbiased." Each firm is free to spend whatever amount it desires and in whatever area it may choose. The tax reductions preserve management's autonomy.

The decree describing the application [of the research tax credits] has been published and it reinforces the unbiased nature of the tax credit apparatus, especially with respect to the small- and medium-sized industries, by broadly defining research expenditures which can be utilized, especially for personnel. This fine-tuned measure should encourage private industry to increase its research efforts. Thus, firms will participate more actively in the achievement of national research development goals. The competitive ability of each firm and the success of the nation's industrial modernization effort will be contingent on the development of research.

12420
CSO: 3698/354

BRIEFS

RESEARCH PRIORITY FOR FRANCE--Despite the approval of the "budget of courage" for 1984 by the Council of Ministers on 22 June, budget cuts will not affect research and industry, or [programs concerned with] training, culture and the family. These areas will remain among France's top priorities, according to government spokesman, Max Gallo. The French president has felt it necessary to personally reiterate the importance of research and industry in the development and modernization of the French industrial apparatus, in the face of worldwide economic competition. It remains to be seen to what extent--if it increases--the 1984 budget for the Ministry of Industry and Research will rise. [Text] [Paris AFP SCIENCES in French pp 3-4] 12420

FRANCE PROMOTES INDUSTRIAL COOPERATION--France is determined to expand European cooperation in the areas of industry and research in an effort to propose important measures for the development of industries of the future to her European partners. Laurent Fabius, minister of industry and research, has just assigned Francois La Grange, director of applications for the Council of State, the task of designating new projects to be proposed to France's neighbors. According to the communique on this subject issued on 20 June, the French Government feels that "the European community as a whole will not become stronger in years to come unless it is supported by the solidarity of all those who are working within the community." Also, [according to the communique], "The idea of an industrial and technological Europe goes hand in hand with the idea of a European social zone, whose creation was proposed 2 years ago by the French president." Emphasizing that, "European industry is currently threatened by a serious technological gap between itself and both the United States and Japan," and that, "if each European nation acts alone, the chances of eliminating this gap are slim," the French Government deems it "necessary to pool certain human and financial resources for research, for investment, and for production, so as to bring about a true European industrial renaissance." Paris wants to use the successes of the Ariane space program and the Airbus [medium-range] transport program as concrete proof [of the potential benefits of European cooperation]. [Text] [Paris AFP SCIENCES in French 23 Jun 83 p 6] 12420

CSO: 3698/354

FIAT'S FINANCIAL RESULTS FAVORABLE FOR 1982

Paris AFP SCIENCES in French 5 Jul 83 pp 3-4

[Text] Turin, 4 Jul (AFP)--The results obtained by Fiat in 1982 confirm the improvements made in productivity and the correctness of the strategy chosen at the end of the 1970's. This was reported on Monday by Giovanni Agnelli, president of the Italian automobile giant.

Speaking to the meeting of Fiat-SPA stockholders, Agnelli recalled that "in the midst of a very negative world situation," the 1982 financial year for the head office ended with a profit of 111 billion Italian lira (about 550 million French francs), compared to 97 billion lira in 1981.

The consolidated balance sheet will not be out until next September, but gross revenues of the Fiat Group amounted to about 103.5 billion francs and should grow by 12 percent in 1983.

Commenting before the board of directors on these results published 24 May, Agnelli emphasized the productivity effort made by the group, which made it one of the few European automobile manufacturers to make a profit in 1982 along with Mercedes and BMW.

The president of Fiat told the stockholders: "The productivity gains made in 1981 and then again in 1982 brought the group near the level reached by its main European competitors."

According to Agnelli, this progress was due to a high rate of investment and the improvement of labor relations within the company.

Fiat invested about 6.7 billion French francs in 1982. The group has resolutely committed itself to the robotization of the automobile production lines. In 2 years is has invested more than 6 billion francs for development and introduction of the "Uno" model.

However, Fiat management emphasize that it was the end of the labor troubles that had been going on for 2 years in the group's automobile factories which made it possible to halt the deterioration in Fiat's position, which had gone downhill in the 1970's.

After a confrontation with the trade unions in the autumn of 1981, Fiat succeeded in imposing a long-term furlough (cassa integrazione) of 24,000 workers.

Fiat emphasized that after this victory by management absenteeism dropped off sharply and the quality of work improved. The total number of workers employed by the group was reduced from about 300,000 in 1981, to 263,760 in 1982.

In the course of the next few months 2,500 workers will be re-employed in southern Italy. However, Mr Agnelli stated: "Without an improvement in the situation we cannot rehire more workers."

The progress made in productivity has enabled Fiat within a few years to increase its production in Italy from 1.7 million cars to the 1.1 million [as published] now being produced. This increased production is necessary for its finanical equilibrium.

Thus, the Fiat automobile manufacturing division is now making profits with the 1,297,000 vehicles produced around the world in 1982. It definitely registered a deficit of 400 million francs in 1982, attributed to increased difficulties encountered in Latin American (1.7 billion francs lost in 1982, compared to a loss of 1.25 billion in 1981). However, Fiat reports a net improvement in the European market with profits of 1.3 billion francs in 1982 compared to neither profit nor loss in 1981. Its share of the European market remained stable at 13 percent in 1982 but declined slightly for the first 5 months of 1983.

Despite the good overall results which also cover the components, industrial vehicles and agricultural tractor branches, Mr Agnelli is concerned about the world recession's effects on the automobile sector. He noted that, despite a slight European recovery in 1982, automobile production in Europe remains 20 percent below the highest level achieved in the past. According to him, the European automobile industry is going to have to solve a problem of overcapacity in production.

In spotlighting the difficulties which affect Italy in particular, Mr Agnelli expressed concern that efforts being made in rationalization and productivity will be "eaten up" by inflation and high interest rates resulting from an enormous public deficit. Following the Italian legislative elections of 26 and 27 June, the president of Fiat emphasized that the country was now more difficult to govern. Calling for a stronger executive branch in the government, he called on the government "to make decisions with courage and energy to overcome a social situation which was becoming increasingly difficult so as to allow for a new period fo reconstruction."

Speaking to the press, Mr Agnelli emphasized in particular that "the recovery of the Western economies required a reduction in inflation, drastic cuts in public spending, control of the money supply and reduction of demand." He added: "Whether you call that Reaganism, Thatcherism, or Delors-ism, it's the same thing. Even a French parliament with a Socialist majority has not been able to do anything else."

The 1982 Fiat balance sheet was unanimously approved by the stockholders. The annual dividend, set at 160 lira per share, as against 140 lira in the previous year, will be payable as of 19 July.

5170
CSO: 3698/372

END